

Fuels of the Future?

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INTRODUCTION

Since the first Oil Embargo, many in governments, industry and academia have been operating on the belief that alternative transportation fuels (and vehicles) will need to be developed to meet society's future mobile transportation requirements. The reasons for their beliefs varied over time from projected future high crude oil prices (economics), energy security, reducing mobile source pollutants and more recently, green house gases. As energy prices stabilized or declined, the economic and security arguments have diminished. An example of using AFVs (alternative fuel vehicles) for reducing mobile source pollutants was the U.S. Administration's original proposal in the 1990 Clean Air Act Amendments that would require the use of methanol fueled vehicles in the ten highest polluted cities. That policy proposal was eventually replaced by the Reformulated Gasoline (RFG) program. California made a similar attempt with their M85 (methanol) fuel program that has since seemed to stagnate.

In more recent years, California ratcheted down the tailpipe emission standards which pressured automakers to consider AFVs. However, the automakers found that they could take advantage of the cleaner burning properties of the reformulated gasoline to develop vehicles that could meet the tighter standards without investing in the more expensive AFVs. The most recent argument for AFVs has been to reduce green house gases. In response, the auto industry appears to be developing combustion engine technologies that may achieve the high fuel economy goals without switching to AFVs. Therefore, it appears that in the future the marketplace will more likely be converting the alternative energy sources into synthetic liquid fuels that look like gasoline or diesel instead of converting the vehicles to run on alternative fuels. Pursuing this pathway avoids much of the infrastructure economic hurdles that has burdened the development of the AFV market.

Does society or the marketplace need to switch to alternative fuels for future mobile transportation? Past and recent experience suggests that as gasoline and diesel quality becomes cleaner, the automakers are finding that they can burn these conventional fuels in vehicles more efficiently and cleanly by improving both the combustion engines and exhaust after-treatment technologies. This dampens, if not eliminates, the need for society to change over to an entirely new power train technology such as fuel cells. Therefore, it is highly likely that the fuel of the future will be a very clean gasoline or diesel. What is probably a more appropriate question is what will be the future hydrocarbon energy source for making gasoline and diesel in the future (natural gas or biomass?) as crude oil resources are eventually depleted. The following discussion reviews some of the issues that has driven the need (or belief) to switch to Alternative Fuel Vehicles (AFV).

DISCUSSION

The Oil Embargoes of the 1970's created a fear that oil supplies were declining and therefore helped spur the creation of the U.S. Department of Energy and the original push to develop fuel alternatives for gasoline derived from crude oil. Even though crude oil and energy is a commodity product, energy forecasters in the 1980's projected that crude supply alternatives to OPEC controlled crude would not develop (Chart 1)[1]. As a result, they ignored doing the fundamental cost analysis of the marketplace's ability to develop alternative crude supplies, and therefore projected that crude oil prices would climb much higher than \$20 per barrel (Chart 2)[1].

A common flaw in projecting a tightening crude supply market is to compare future oil consumption to the present estimate for conventional crude oil reserves, and thereby ignore the much larger supply of other oil resources and additional occurrences. The flaw in this economic supply demand analysis is the implicit assumption that oil recovery technology will not substantially improve to tap into these other potential oil supplies. When projected consumption is actually stacked against all oil sources, Chart 3 suggests that there may be a century worth or more of oil supply available for future oil markets [2]. Chart 4 shows that historical crude prices (corrected to a 1995 dollar basis) lie mostly between \$10 and \$20 per barrel [3]. Assuming oil